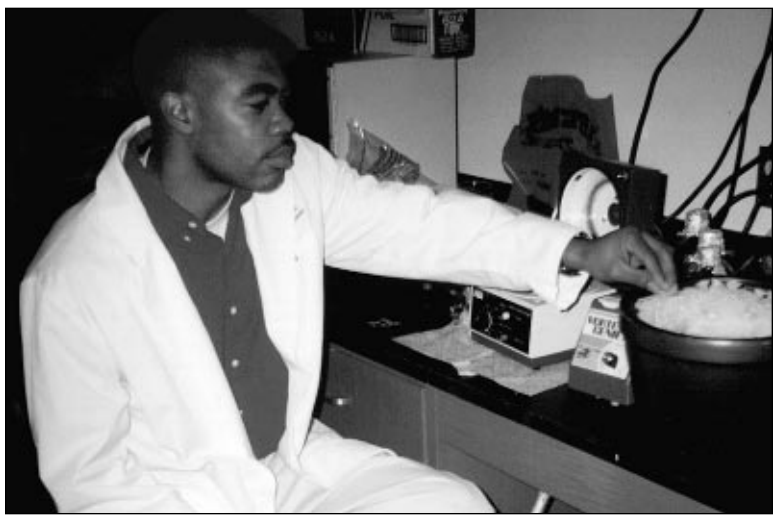


Chris Jones sets up bioreactors for simulated microgravity studies. Three research groups will obtain data that can be integrated and will provide a more precise understanding of the physiological responses to microgravity.

Morehouse assessing biomedical research changes in spaceflight

Morehouse School of Medicine is developing an infrastructure for space medicine and life science research that will help NASA understand the effects of microgravity on the human body.

"The Space Medicine and Life Sciences Research Center, or SMLSRC, is helping develop ground-based research to assess the mechanisms underlying the cardiovascular, musculoskeletal and neuronal effects of microgravity," said Dr. Gary Sanford, a cell biology investigator at the SMLSRC. "The three research groups will use one or more of the research models to obtain data that can be integrated and will provide a more precise understanding of the physiological responses to microgravity."

The three research groups are using altered gravity models, both animal and human, to obtain data. The cardiovascular group uses the head-down tilt bedrest human model and the hind-limb suspended rat model; the cell culture group uses both hypergravity (centrifugation) and the low-shear horizontally rotating bioreactor for cellular studies; the musculoskeletal group uses the hind-limb suspended rat model.

"As the SMLSRC develops and faculty research expertise becomes established, it is anticipated that increased collaborative relationships and non-NASA support will occur," Sanford said.

Both Morehouse and NASA will benefit from the development of multifaceted research that gives students hands-on experience in space medicine and life science research.

"The Morehouse investigations will provide new perspectives on the mechanisms of space flight-induced physiological changes," said Dr. Clarence Sams, a member of the NASA Technical Review Committee that oversees the Morehouse research. "This information will improve the assessment of crew member health risks and will aid the development of appropriate countermeasures to the adverse effects of space flight."

Morehouse Project Director Dr. Myrtle Thierry-Palmer works closely with students to obtain valuable research that will establish guidelines for future space travelers.

Prairie View radiation research benefits solar system exploration

The Center for Applied Radiation Research at Prairie View A&M has developed new state-of-the-art instrumental methods that are providing cheaper and safer ways to evaluate the response to space radiation of electronic, photonic and bio systems.

The center focuses on four components—research, human resource development, service, and commercialization and technology transfer. It examines three technical areas, space environment simulation, radiation effects on electronic and photonic systems and biosystems. While the center covers a wide range of topics for research, it concentrates on radiation effects.

"We have continued to improve our measurement capabilities which will allow a better understanding of defects at the interface between silicon and silicon dioxide," said Dr. Richard Wilkins, senior research scientist at the center. "The quality and integrity of this interface governs the performance of most advanced integrated circuits including those used in space applications."

Wilkins said the center recently has embarked on projects in new materials and quantum devices that have the potential for revolutionizing space technology. Students are studying the electrical characterization of wide band semiconductor ilmenite, a common mineral found on the Moon.

"The minority university research and technology efforts have made significant contributions including techniques for recycling resources for prolonged stays in space or on planetary surfaces, modeling of gravity and radiation effects on humans, understanding the effects of space radiation on spacecraft and monitoring of environment within the habitable areas," said Dr. Kumar Krishen, JSC's chief technologist for technology transfer and commercialization.

Krishen chairs the NASA Technical Review Committee that oversees the Prairie View Research. He works closely with Director Thomas Fogarty to obtain valuable research on the effects of radiation on space travelers.

Kirk Powell, left, explains to Elonda Ledet how to load a sample into the scanning probe microscope with the help of Dr. Richard Wilkins, senior research scientist at Tuskegee University. Students are studying wide band semiconductor ilmenite, a common mineral found on the Moon.

Tuskegee research focuses on planetary outpost food growth, recycle

Researchers at Tuskegee University are currently developing food sources that future space explorers may grow on planetary outposts.

Tuskegee's Center for Food and Environmental Systems for Human Exploration of Space, or CFESH, is conducting research on sweet potatoes and peanuts in order to gather information on production, processing, usage and recycling.

Dr. Walter Hill, director of CFESH, said the university is evaluating the crops for compactness of growth, high yield, dry matter content, early maturity and good nutritive qualities and taste.

"These two crops can be processed into a variety of foods using foliage, roots and nuts," he said.

The work of CFESH is organized under four teams, Hill said. The Germplasm Development and Improvement team evaluates the crops for growth in controlled environments. The team is using both conventional breeding and molecular genetics techniques to produce plant material with desirable traits for an advanced life support system.

The Crop Production and Environmental Systems team focuses on gathering baseline data on growth and yield under a variety of conditions.

"In the near future, this team will experiment with solid substrates such as lunar simulants and zeolites that are being used at JSC," Hill said.

The third team, Waste Management and Recycling, is developing ways to recycle the crop in a partially closed-loop system, while the fourth team, the Food Technology and Utilization team, evaluates the nutritional value of the crops. The team also is developing food processing techniques and storage criteria and is developing menus items that enhance nutrition and taste good for future space explorers.

"The two crops at Tuskegee may be amoung the crops that we will grow in the new Bio-Plex," said Dr. Doug Ming, space scientist involved with space plant growth in Engineering's Crew and Thermal Systems Division. "Bio-Plex will test life support systems for a planetary outpost."

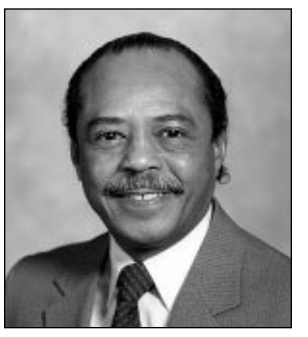
Bio-Plex, the acronym for Bioregenerative Planetary Life Support System Test Complex, is currently under construction in Bldg. 29 and is expected to be operational at the beginning of the next century.

"Tuskegee will work closely with the developers of the Bio-Plex facility at JSC," Hill said. "This type of testing will provide the necessary data for a similar facility to be used on the Moon and or Mars in the coming century."

Dan Barta is a member of the NASA Technical Review Committee that oversees the work at Tuskegee University.

'Over the years, the underpinning of this program has been an increase of the involvement by JSC managers and the enthusiastic interest of minority universities to participate in the NASA mission.'

—Dr. Joseph Atkinson
Director, Minority University Research and Education Program



From left: 1) High school interns Tarmen Siaway and Darren Kindell cut apart the foliage so measurement can be taken of leaves and petioles of each sweet potato plant during harvest time. 2) Ivy Bradford, a chemistry graduate student, and Kendra Stanciel, an environmental sciences graduate student, examine the storage and other root components of sweet potato plants. 3) Dr. Desmond Mortley, Crop Production and Environmental Systems team lead, and graduate student Kendra Stanciel examine a channel of peanuts taken from a growth chamber for harvest and data collection.